CONTRIBUTION OF MX TO THE STRATEGIC FORCE MODERNIZATION PROGRAM

The Administration has decided to base the MX missile in the so-called "closely spaced basing" (CSB), or "dense-pack" mode. The CSB scheme will place 100 MX missiles in vertical shelters that are "superhardened" to withstand large nuclear blasts. The shelters will be approximately 1,800 feet apart in a narrow array about 14 miles long. If the Congress approves the basing decision, MX in CSB will be deployed in Wyoming, with the first missiles available sometime in 1986. According to Air Force estimates, MX in CSB would cost $26 billion in fiscal year 1982 dollars.

The Air Force contends that this new basing system will provide a measure of survivability to the MX missiles because of the phenomenon of "fratricide." Incoming Soviet warheads would destroy other Soviet warheads that were not detonated at precisely the same instant; the radiation, heat, blast, and debris created by explosion of the first warheads would destroy or blow off course follow-on warheads. MX missiles in superhard silos would be able to survive this destruction, to be launched later when the environment had cleared up. MX would survive in CSB for only a matter of hours, however, since subsequent strikes could be launched against surviving shelters once the debris and dust had settled.

The technical claims for the survival of MX in CSB have been, and likely will continue to be, widely disputed. Press reports as of last September indicated that the Air Force expected 50 to 70 percent of the MX force to survive if placed in CSB. Information in the press after the President's decision suggested that the Air Force places survival prospects at 70 percent. On the other hand, some analysts clearly believe that few if any of the missiles would survive. It is beyond the technical competence of the Congressional Budget Office (CBO) to make an independent assessment of MX survivability in dense pack. For purposes of this analysis, CBO assumed that 60 percent of the missiles, the mid-point of the earlier range, would survive. A discussion at the end of the paper notes the impact of assuming higher or lower survival rates.

This paper summarizes CBO's analysis of the contribution of the MX missile to U.S. strategic capabilities, assuming that closely spaced basing allows a substantial number of MX missiles to survive.

SIZE OF THE MX CONTRIBUTION WOULD DEPEND ON TOTAL ADMINISTRATION PROGRAM

Key Systems

The contribution of the MX missile would be relative to that of other strategic forces in the Administration's plan. Most of the plan is publicly available, though some details are not. The following programs are assumed to be part of the Administration's strategic buildup:

- Deployment by 1989 of 100 MX missiles in the closely spaced basing mode;

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- Deployment by the late 1980s of 100 B-1B bombers and by the early 1990s of 132 "stealth," or advanced-technology, bombers (ATB);

- Deployment by the mid-1990s of 3,800 air-launched cruise missiles, initially on refitted B-52 bombers and eventually on B-52 and B-1 bombers;

- Continued procurement through 1992 of Trident submarines at current rates (one per year) plus, by 1996, deployment on all Trident submarines of the new, larger Trident II (D-5) missile currently being developed;

- Deployment by 1988 of about 400 nuclear-armed, sea-launched cruise missiles.

Measures of Strategic Modernization

The Administration program will result in a major buildup of U.S. strategic forces. The following discussion examines this buildup in terms of two measures:

- total warheads, which serves as a rough guide to the number of targets that can be attacked;

- "hard-target" warheads, which is the number of warheads that can destroy targets, such as missile silos and command bunkers, that are hardened against nuclear effects.1/

Values for these measures depend on the particular scenario for nuclear exchange.

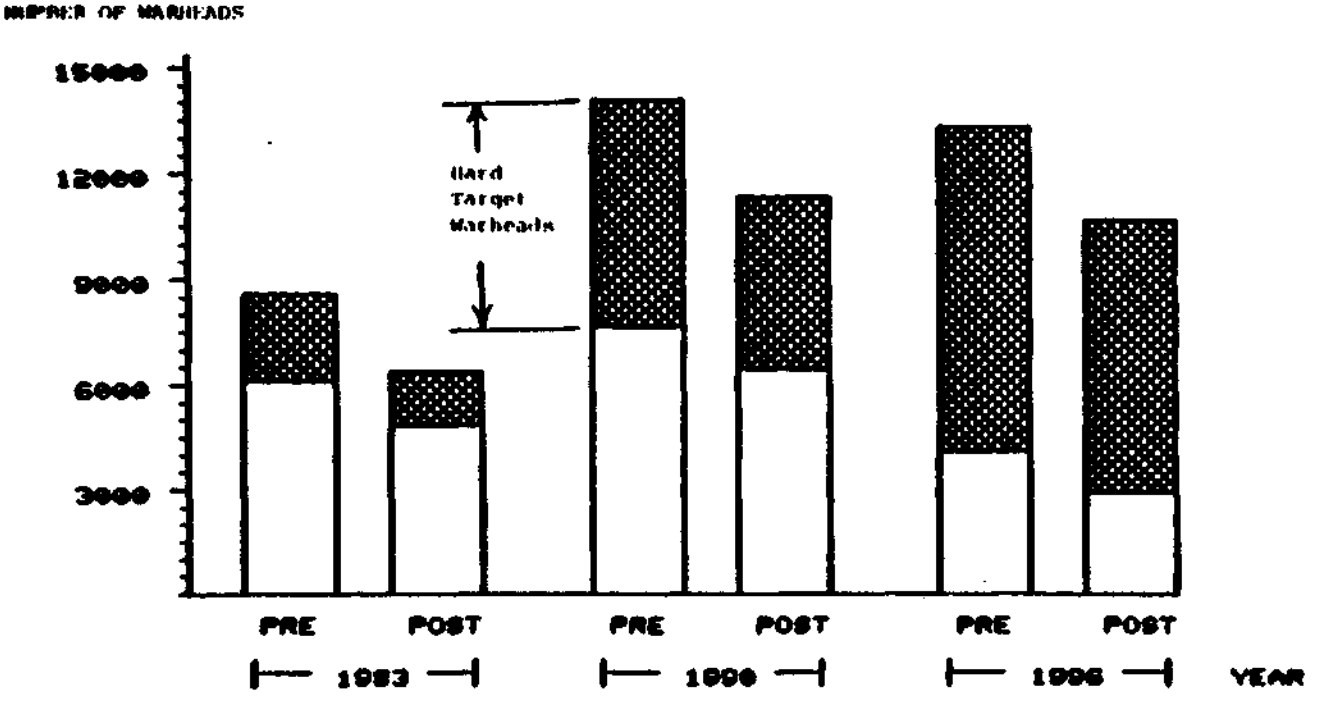
This analysis assumes a scenario in which the Soviets have mounted a major first-strike attack against all U.S. strategic forces. Figure 1 shows the Administration's planned buildup of U.S. forces in total warheads and hard-target warheads (shaded portion) before a strike ("pre-strike") and an estimate of the number of those warheads that would survive a postulated major strike ("post-strike"). The analysis also assumes sufficient advance warning of the attack to allow most U.S. forces to be on alert.

1/ Hard-target kill weapons in this paper are those that have a single-shot probability of 0.5 of destroying a target hardened against 4,000 pounds per square inch of static overpressure.

FIGURE 1

STRATEGIC FORCE BUILDUP, 1983 TO 1996

(PRE AND POST STRIKE, WITH WARNING)



Given these assumptions, the Administration's program would substantially increase strategic capabilities. Numbers of surviving warheads, for example, would go from 6,500 in 1983 to 11,400 in 1990, an increase of 75 percent. By 1996, the number of warheads would fall back to 10,700 as some older submarines were retired.

The more dramatic increase would come in the numbers of surviving warheads that could destroy hard targets. That number would go from 1,600 in 1983 to 5,000 by 1990 (an increase of 213 percent) and to 7,900 in 1996 (an increase of 395 percent). The dramatic growth from today's low levels occurs because all the systems noted above--the MX, B-1, ATB, cruise missiles, and Trident II--can deliver warheads capable of destroying hard targets. This growth indicates U.S. emphasis in recent years on hard-target capability, which has become an increasingly important feature of nuclear forces since the mid-1970s.

The buildup noted above for post-attack surviving warheads also applies to the pre-strike situation, though obviously the inventories are larger. Because the critical element in the MX debate is the search for a survivable basing mode, the remainder of this report concentrates on the post-strike scenario.

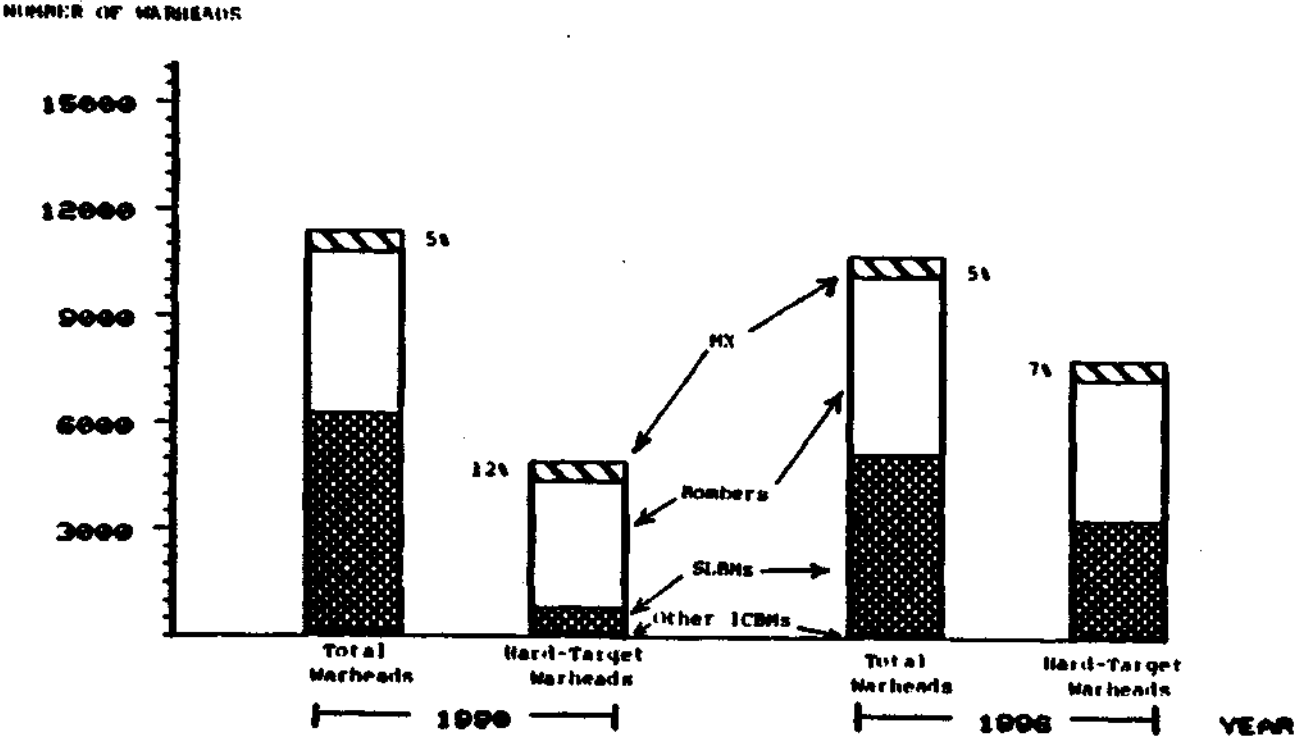
MX CONTRIBUTION SMALL IN PERCENTAGE TERMS

In part because of this substantial buildup in all U.S. nuclear forces, the percentage contribution of the MX system would be small, though qualitative factors mentioned later in the paper--such as maintaining the diversity of the strategic triad and showing resolve in arms control negotiations--may argue for the MX. Figure 2 shows the contribution of MX in two critical periods. By 1990 the MX would be fully fielded, but the

FIGURE 2

CONTRIBUTION OF MX AND OTHER SYSTEMS, 1990 AND 1996

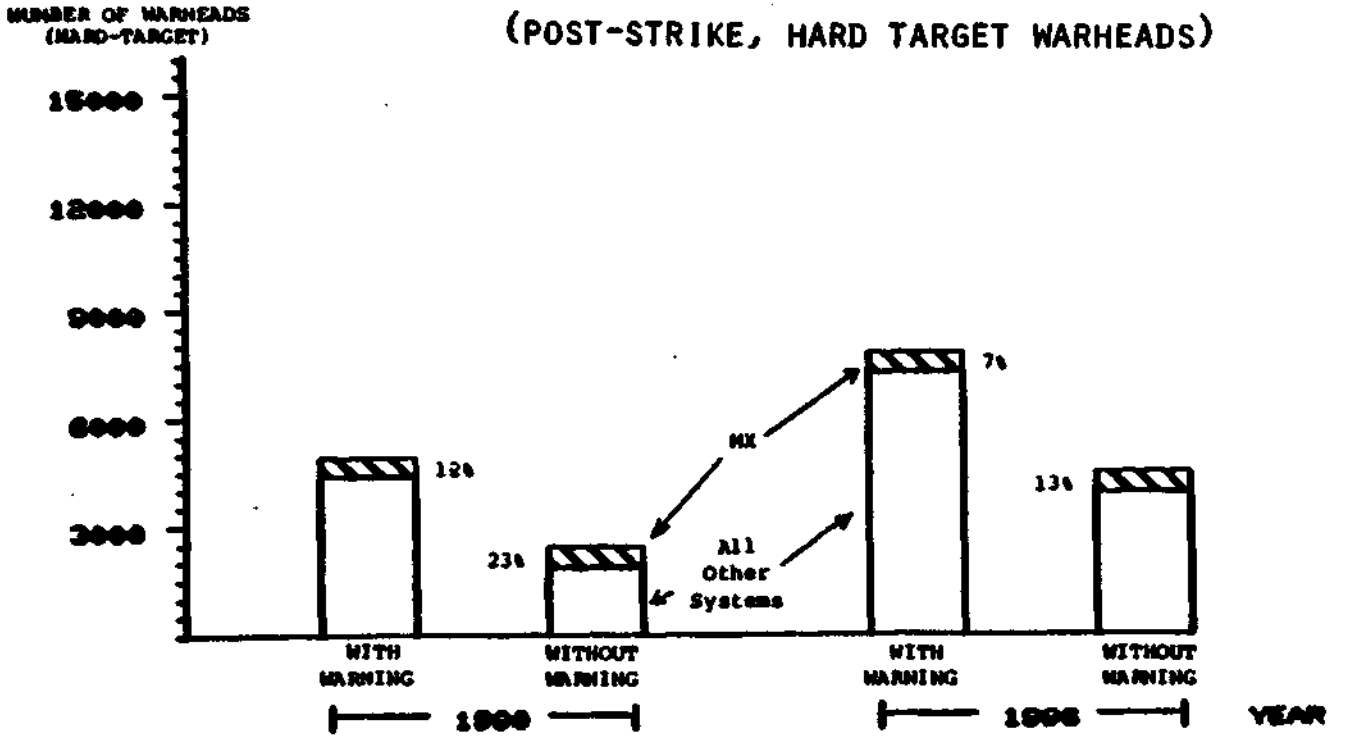
(POST-STRIKE SCENARIO, WITH WARNING)



Trident II would just be entering service and the ATB bomber would not yet have been deployed. By 1996 all major initiatives would be fielded. By 1996, when the systems discussed above were all deployed, the MX would contribute about 5 percent of all U.S. strategic warheads and about 7 percent of hard-target warheads. In 1990, when modernization efforts were still incomplete, the MX would contribute only 5 percent of total warhead inventories but as much as 12 percent of hard-target warheads. These results assume the post-strike, with-warning scenario for a nuclear exchange discussed above, unconstrained by arms control limits. The remainder of this paper emphasizes hard-target warhead inventories, since that is the primary character of the buildup and presents the strongest case for the MX system.

FIGURE 3

SURPRISE ATTACK VERSUS ATTACK WITH WARNING:
CONTRIBUTION OF MX AND OTHER SYSTEMS, 1990 AND 1996
(POST-STRIKE, HARD TARGET WARHEADS)



MX Contribution Higher in "Bolt out of the Blue" Attacks

The contribution of the MX would be higher if a Soviet attack came as a complete surprise, destroying bombers and submarines that might otherwise escape with sufficient warning. In this "bolt out of the blue" scenario, the contribution of the MX would be larger since land-based missiles are nearly 100 percent ready on a continuous basis. By contrast, only one-third of the bomber force and two-thirds of the submarine force are on alert in peacetime. By 1996--in a scenario with no warning--the MX would contribute 13 percent of hard-target warheads (see Figure 3). If measured in 1990, before Trident II was fully deployed and the ATB was fielded, the MX would provide up to 23 percent of hard-target warheads in these surprise attack scenarios. Some proponents maintain that the constant readiness of the MX and other land-based missiles would contribute qualitatively as well as quantitatively to deterrence. Other analysts consider the "bolt out of the blue" attack an unrealistic scenario.

Considering Soviet Air Defenses Could Increase MX Contribution

The contribution of the MX would be higher if measured in warheads likely to penetrate the Soviet Union's defenses and reach their targets.

CBO has used the measure of warheads likely to survive a Soviet first strike, rather than those likely to survive and penetrate, to avoid security classification problems. Most warheads fired from land-based missiles and submarines would be likely to penetrate, while some bomber weapons would not. If, for example, an average of only 75 percent of all bomber weapons were able to penetrate Soviet air defenses, then the 1996 contribution of the MX--in the post-strike, with-warning scenario--would amount to 8 percent (compared with 7 percent assuming that all bomber weapons penetrate) of hard-target kill capability.

Arms Control Could Increase MX Contribution

The contribution of the MX could also be increased by arms control agreements, depending on how they were implemented. The U.S. START proposal, for example, calls for reductions of about one-third in U.S. and Soviet ballistic missile warheads. (CBO assumed a similar one-third reduction in bomber warheads, though the U.S. proposal did not mention bombers. If no bomber reductions are included, the contribution of MX would be even smaller.) If the U.S. START proposal and a bomber limit were in place, and if the Administration continued its strategic buildup, then the United States would have to retire a number of older systems early, particularly Poseidon submarines. This would increase the contribution of the MX. By 1996--in a post-strike, with-warning scenario--the MX would provide 8 percent of hard-target kill capability, compared with 7 percent in the absence of START (see Figure 4). The expired SALT I treaty, and the proposed SALT II treaty, would--if their provisions were adhered to--have effects on the contribution of the MX similar to those of the START proposal.

MX CONTRIBUTION DEPENDS ON COMPLETION OF OTHER STRATEGIC PROGRAMS

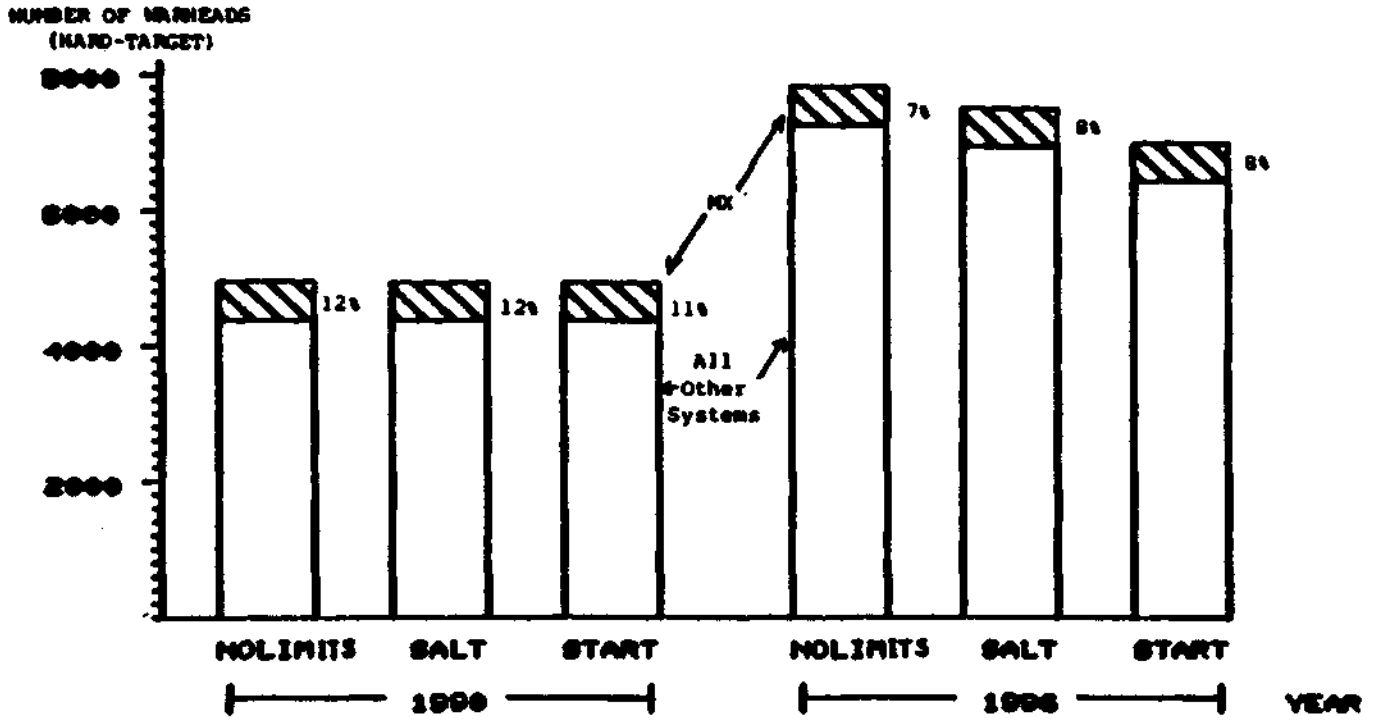
These findings about the contribution of the MX depend on completion of the other Administration programs described above. Bombers would make an important contribution. By 1996--in the post-strike, with-warning scenario without any arms control limits--bombers would contribute 50 percent of all hard-target kill capability (see Figure 2). The bomber programs that would contribute this capability include the B-52 bomber armed with cruise missiles, the B-1B bomber, and the stealth bomber.

Continuation of the Trident submarine program, coupled with deployment of the larger and more accurate Trident II missile, would also have important effects. Sea-launched cruise missiles would add more modestly to capability. By 1996--in the same scenario just discussed--these sea-based forces would contribute 42 percent of all hard-target kill capability (see Figure 2).

FIGURE 4

IMPACT OF ARMS CONTROL: MX AND OTHER SYSTEMS, 1990/1996

(POST-STRIKE, WITH WARNING)



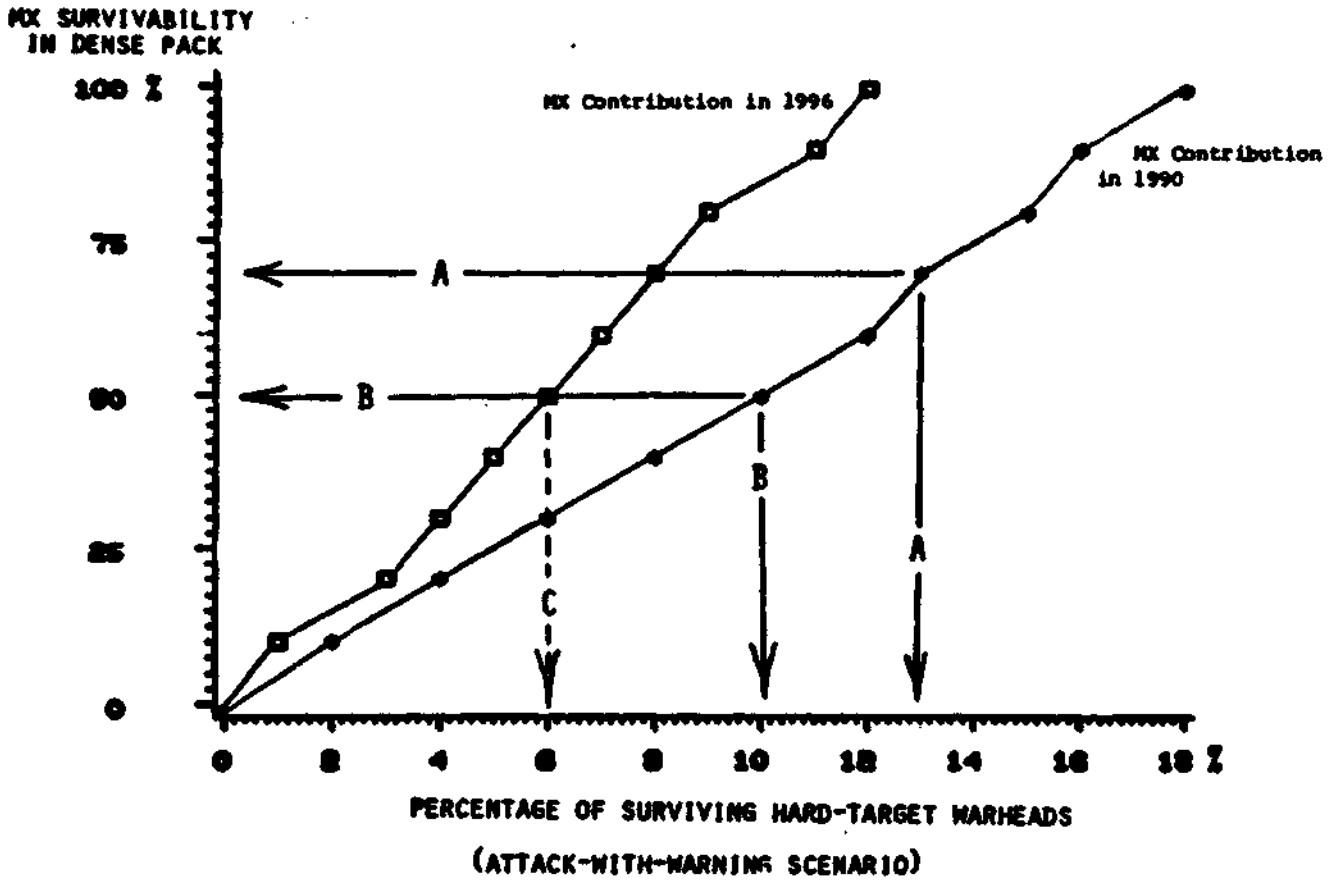
MX CONTRIBUTION WOULD VARY DEPENDING ON SUCCESS OF CLOSELY SPACED BASING

As noted above, there has been substantial technical debate concerning the survivability afforded through the closely spaced basing system. The Congressional Budget Office cannot independently evaluate the technical issues underlying closely spaced basing--for example, the plausibility of superhardening missile silos. This analysis assumed 60 percent of MX missiles in closely spaced basing survive; 60 percent is the midpoint between Air Force survivability estimates reported in the press. Actual survivability could well differ from this range. Figure 5 shows the contribution of the MX in 1990 and 1996 to surviving inventories of hard-target warheads, assuming different survivability levels. For example, if MX survivability in 1990 was 70 percent, its hard-target contribution would be 13 percent (see "A" Arrows on Figure 5). If 50 percent survived, its contribution would drop to approximately 10 percent ("B" Arrows). The level of contribution in 1996 would be consistently lower than in 1990 because of the larger stock of surviving warheads in 1996 as the ATB bomber and Trident II missiles were fielded.

FIGURE 5

IMPACT OF CSB SURVIVABILITY ON MX CONTRIBUTION

(POST-STRIKE, HARD TARGET, WITH WARNING)



This analysis presumes that closely spaced basing would be able to provide uniform survivability over time. More likely, survivability would decline as Soviet planners developed new methods to defeat the system. For example, in 1990 survivability might be 70 percent, but could drop to 50 percent by 1996. In that instance, MX contribution would drop to 6 percent ("C" Arrow) unless corrective measures--such as ballistic missile defenses--were taken. The Defense Department has identified supplementary actions to improve CSB survivability over time--such as deceptive basing using superhardened silos as well as ballistic missile defenses. Those actions would be expensive and would increase program costs over Air Force baseline estimates of $26 billion (without inflation).

IMPORTANT QUALITATIVE FACTORS MAY ARGUE FOR MX

When viewed in conjunction with these other Administration modernization efforts, the quantitative contribution of the MX would be small in percentage terms. Nevertheless, a number of important qualitative attributes of land-based missiles in general, and of the MX in particular, could argue for continuation of the MX program.

Among the more important qualitative contributions of MX would be the demonstration of U.S. resolve to maintain diversity in nuclear forces through a triad of strategic forces able to survive a Soviet first strike. This diversity would provide insurance against a Soviet technological breakthrough that might threaten one or more legs of the triad. Continuation of the triad concept would also force the Soviets to allocate their research and development efforts against three types of U.S. strategic forces, each of which must be countered with different systems.

The Administration has argued that continuing development and deployment of the MX would be critical to the success of the current round of strategic arms reduction talks. Proceeding with the MX might, for example, show U.S. resolve and provide a "bargaining chip" for use in reaching a compromise. As noted above, the MX would contribute between 7 and 12 percent of hard-target inventories under arms control limits (see Figure 4).

Another major point in favor of the MX is the increase it would provide in the U.S. ability to retaliate promptly against Soviet targets that are hardened against nuclear effects. From what is known publicly about U.S. retaliatory strategy, the United States may count on the capability to retaliate quickly against certain hard targets--especially those capable of further attacks on the United States--during either a limited nuclear war or an all-out retaliation. Some of the existing land-based Minuteman missiles could have a prompt capability to destroy hard targets, but their predicted lack of survivability might leave few available. Bombers require hours to fly to the Soviet Union. And, although the hard-target capability of the sea-based forces would increase dramatically with the introduction of sea-launched cruise missiles and the Trident II missile, it is not clear that the required command, control, and communications links would be available to enable these forces to respond quickly in some conflicts.

The closely spaced basing concept could, however, detract from some of the traditional, qualitative advantages of land-based missiles. For example, could the United States fire the MX missiles promptly if the Soviets attempted to "pin down" the missile field with a sequence of attacks? Would MX command and control be affected by such a large number of nuclear detonations in such a small area? Detailed analysis of these issues is beyond the scope of this paper.

CONCLUSION

The Congress, then, must appraise the qualitative considerations that favor the MX along with its costs and contribution to overall strategic capabilities. MX would maintain the diversity inherent in a triad of strategic forces and would support the Administration's desire to show resolve during ongoing arms control negotiations. Air Force estimates suggest, however, that the MX missile would cost about $26 billion in 1982 dollars. Moreover, analysis in this paper suggests that, in part because of the buildup of other strategic forces, the contribution of the MX to overall U.S. strategic capabilities would be relatively small--between 5 and 13 percent by 1996.